phased array transceiver circuitry for beam steering wireless signals using the array of antennas.

3. The removable electronic device case defined in claim **2** wherein the radio-frequency transceiver circuitry and array of antennas are configured to wirelessly communicate with the external equipment in an extremely high frequency band.

4. The removable electronic device case defined in claim **2** wherein the radio-frequency transceiver circuitry and array of antennas are configured to wirelessly communicate with the external equipment in a 60 GHz frequency band.

5. The removable electronic device case defined in claim **4** further comprising an integrated circuit that includes the antenna array and the radio-frequency transceiver circuitry.

6. The removable electronic device case defined in claim **5** further comprising an intermediate frequency antenna structure and an intermediate frequency transceiver circuit coupled to the intermediate frequency antenna structure, wherein the intermediate frequency antenna structure and intermediate frequency transceiver circuit wirelessly communicate with the electronic device using intermediate frequency wireless signals.

7. The removable electronic device case defined in claim **6** wherein the radio-frequency transceiver circuitry includes upconverter circuitry that converts intermediate frequency signals from the intermediate frequency transceiver circuit to radio-frequency signals that the radio-frequency transceiver circuitry transmits to the external equipment with the antenna array.

8. The removable electronic device case defined in claim **7** wherein the radio-frequency transceiver circuitry includes downconverter circuitry that converts radio-frequency signals that the radio-frequency transceiver circuitry receives from the antenna array to intermediate frequency signals that are received from the radio-frequency transceiver circuitry by the intermediate frequency transceiver circuit.

9. The removable electronic device case defined in claim **8** wherein the intermediate frequency antenna structure is near field coupled to a corresponding intermediate frequency antenna structure in the electronic device.

10. The removable electronic device case defined in claim **9** further comprising circuitry in the body including at least one antenna and radio-frequency-to-direct-current power conversion circuitry that receive radio-frequency wireless power signals from external circuitry and that convert the received radio-frequency wireless power signals into direct current power that is supplied to the electronic device.

11. The removable electronic device case defined in claim **10** wherein the at least one antenna and radio-frequency-to-direct-current power conversion circuitry are configured to receive microwave radio-frequency power wireless power signals.

12. The removable electronic device case defined in claim **1** wherein the radio-frequency transceiver circuitry is configured to transmit and receive 60 GHz wireless communications.

13. The removable electronic device case defined in claim **1** wherein the radio-frequency transceiver circuitry is configured to transmit and receive wireless communications signals at frequencies above 60 GHz.

14. The removable electronic device case defined in claim **1** wherein the radio-frequency transceiver circuitry is configured to transmit and receive wireless communications signals below 100 MHz.

15. A removable electronic device case that is configured to mate with an electronic device and that receives wireless power from external equipment, comprising:

a body configured to mate with the electronic device; and

circuitry in the body that includes at least one antenna and radio-frequency-to-direct-current power conversion circuitry that receives radio-frequency wireless power signals from the external equipment and that converts the received radio-frequency wireless power signals into direct current power that is supplied to the electronic device.

16. The removable electronic device case defined in claim **15** further comprising a connector in the body that is coupled to the electronic device, wherein the circuitry provides the direct current power to the electronic device through the connector.

17. The removable electronic device case defined in claim **15** further comprising an antenna structure that is wireles sly coupled to the electronic device, wherein the circuitry wirelessly supplies power to the electronic device through the antenna structure.

18. The removable electronic device case defined in claim **15** wherein the at least one antenna is configured to receive microwave wireless power signals from the external equipment.

19. The removable electronic device case defined in claim **18** wherein the at least one antenna comprises an array of antennas.

20. The removable electronic device case defined in claim **15** wherein the at least one antenna is configured to receive wireless power signals from the external equipment at a frequency selected from the group consisting of 2.4 GHz and 5 GHz.

21. The removable electronic device case defined in claim **15** wherein the at least one antenna is configured to receive wireless power signals from the external equipment at a frequency above 60 GHz.

22. The removable electronic device case defined in claim **15** wherein the at least one antenna is configured to receive wireless power signals from the external equipment at a frequency selected from the group consisting of 2.4 GHz and 5 GHz.

23. The removable electronic device case defined in claim **15** further comprising an integrated circuit that contains a 60 GHz antenna array that wireles sly communicates in a 60 GHz communications band.

24. A removable electronic device case, comprising:

a millimeter wave transceiver;

an array of antennas coupled to the millimeter wave transceiver that transmit and receive wireless signals in a millimeter wave communications band;

at least one antenna structure that receives wireless power at microwave frequencies; and

a battery that is charged using the received wireless power.

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